CSC384 Assignment 3 Written Answers Part 2

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Question 4

1. The AlphaBetaAgent assumes all opponents will perform rationally (I.e. always make their best move). In the given scenario, if all opponents do their best move, then death is imminent to Pacman. In this case, as discussed in question 2, Pacman will usually commit suicide to get a higher score based on the minimax value.

However, the ExpectimaxAgent assumes that all opponents will move randomly so it can still find a move that leads to higher score and choose that move. (In this case, the Pacman can know that he can possibly get higher score if the ghost does not make his best move.) As a result, if Pacman perceives that he might escape to grab a few more pieces of food, he will try. Since the opponents do move randomly in the given scenario, the ExpectimaxAgent outperforms the AlphaBetaAgent.

2.

(a) True

The return value of a chance node is always greater than or equal to the return value of the min node at the same place. The root max node (and each max node) will choose the max value among all return values from min nodes / chance nodes. Therefore, Ve is always greater or equal to Vm as well.

(b) True

Because Vm is calculated with the assumption that all opponents will always make their best move, which leads to the lowest possible score. Therefore, Vm is the lowest possible score we can get as long as we follow the result from minimax strategy. If the opponents do not always make their best moves, we will only get higher scores.

(c) False

Consider the following case:

Max Layer (Root): M1

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Chance Layer: C1 C2

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Terminal: -10 10 -100 1000

Result from Expectimax (for a chance node, just take average value of its children):

Max Layer: 450

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Chance Layer: 0 450

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Terminal: -10 10 -100 1000

Result from Minimax:

Max Layer: -10

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Chance Layer: -10 -100

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Terminal: -10 10 -100 1000

In this case, Vm is -10 and Ve is 450. If we apply optimal minimax policy, we will follow the left path (marked as red above) and the payoff could be -10 or 10, both values are lower than 450.